Syllabus
Physics 3510, Physics, Computation, and Software Applications
Fall, 2021

Regular Meeting Times: TuTh 9:30PM - 10:50PM, GAB 550A

Instructor: Dr. Carlos Ordonez (or-dawn-ez)

Office: PHYS 302; Phone: 940-565-4860; Email: cao@unt.edu

Instructor's Office Hours: TuTh 8:00AM - 9:20AM or by appointment

Attendance: Attendance is required.

Prerequisite(s): PHYS 1520 or PHYS 2220.

Course Requirements:

Three Exams:	Each Counts 30%
Final Exam:	Counts 30%
Assignments:	Count 10%

Exams: The lowest of the four exam grades is dropped. If an exam is missed for any reason, it will be the one dropped. Make-up exams will **not** be given. Exams are multiple choice, open book/notes, and a computer with access to the internet (provided in GAB 550A) is required. Answer sheets are provided. If you are more than 20 minutes late to an exam, you will not be allowed to take the exam. If you turn in your exam, you must leave the room. Items (e.g., calculators) may *not* be shared during an exam.

Assignments: You may help each other when working assignments (but not when working exams). However, each person must submit separate work. An assignment is penalized 30 points (out of 100) if turned in late by up to one week. Assignments are not accepted more than one week late.

Learning Objectives: To develop computer-based STEM problem-solving skills and learn about STEM computation. The class meetings are optimized to maximize the efficiency at which computer-based problem-solving skills are developed. A typical class meeting includes a computer-based problem-solving component.

About this course: Computers can be used at all stages of research in physics and in other STEM disciplines including: simulating an experiment prior to setup, designing an experimental setup, automating control of the experiment, collecting experimental data, analyzing data to obtain experimental results, running simulations to understand experimental results, running simulations as part of theory development, and running simulations to predict phenomena not previously observed. This course will provide a practical experience on the basics of writing computer simulations and on the role of computers in modern experiments. The course is expected to enhance a student's ability to participate in theoretical and experimental research.

Course description: A basic survey of selected topics at the intersection of computer science, engineering and physics. Student will learn computer programming for applications in physics as well as the physics underlying computation and its physical implementation. Topics include (as time permits): automated control in experimental physics, symbolic computation/analysis, simulation of physical phenomena; physical basis of contemporary computers and computation; physical constraints with respect to size, speed, energy and architecture; classical and quantum computation and implementations.

Schedule

Aug. 24 - Sept. 2 Python (4 class meetings)
Topic: Python - A Programming Language That Is Popular in STEM Fields

Sept. 7 - Sept. 16 Wolfram Language (4 class meetings)
Topic: Wolfram Language - A Programming Language With Symbolic and Numerical Mathematics (e.g., evaluations of Integrals and Derivatives, Solutions To Differential Equations, Expression Simplification, Statistics, etc.)

Sept. 21 **Exam I**

Sept. 23 - Oct. 21 Monte Carlo Methods (9 class meetings)
Topics: Monte Carlo Sampling, Monte Carlo Integration, Random Walk, Classical Trajectory Monte Carlo Simulation

Oct. 26 **Exam II**

Oct. 28 - Nov. 23 Digital Technologies (8 class meetings)
Topics: Digital Language, Experimental Data and Control, Transfer Rate and Storage Limitations, LaTeX, Programing Languages, Programming Language Compiler, Machine Language, the Integrated Circuit, Quantum Computing, Artificial Intelligence, Machine Learning

Nov. 25 Thanksgiving Break (no class)

Nov. 30 **Exam III**

Dec. 2 Pre-Finals Day

Dec. 9 **Comprehensive Final Exam**, 8:00AM - 10:00AM

Additional Information

Academic Integrity Standards and Consequences. According to UNT Policy 06.003, Student Academic Integrity, academic dishonesty occurs when students engage in behaviors including, but not limited to cheating, fabrication, facilitating academic dishonesty, forgery, plagiarism, and sabotage. A finding of academic dishonesty may result in a range of academic penalties or sanctions ranging from admonition to expulsion from the University. A finding of academic dishonesty associated with an exam would result in a grade of zero for the exam.

ADA Accommodation Statement. UNT makes reasonable academic accommodation for students with disabilities. Students seeking accommodation must first register with the Office of Disability Accommodation (ODA) to verify their eligibility. If a disability is verified, the ODA will provide a student with an accommodation letter to be delivered to faculty to begin a private discussion regarding one's specific course needs. Students may request accommodations at any time, however, ODA notices of accommodation should be provided as early as possible in the semester to avoid any delay in implementation. Note that students must obtain a new letter of accommodation for every semester and must meet with each faculty member prior to implementation in each class. For additional information see the ODA website at disability.unt.edu.

Emergency Notification & Procedures. UNT uses a system called Eagle Alert to quickly notify students with critical information in the event of an emergency (i.e., severe weather, campus closing, and health and public safety emergencies like chemical spills, fires, or violence). In the event of a university closure, please refer to Blackboard for contingency plans for covering course materials.